

Benefit Incidence Analysis

Are Government Health Expenditures More Pro-rich Than We Think?

Adam Wagstaff

The World Bank
Development Research Group
Human Development and Public Services Team
March 2010



Abstract

It is generally accepted that government health expenditures should disproportionately benefit the poor. And yet in most developing countries the opposite is the case. This paper examines the implications of a central assumption of benefit incidence analysis, namely that the unit cost of a government-provided service bears no relation to the out-of-pocket payments paid by the patient. It argues that a more plausible assumption is that larger out-of-pocket payments for a given unit of utilization reflect more (or more costly) services being delivered. The paper compares—theoretically and empirically—the standard constant-cost assumption with two alternatives, namely that the cost of care in a specific episode of utilization is (a) proportional to or (b) linearly related to the amount of money paid out-of-pocket by the patient. An interesting special case of

the linear relationship is where subsidies are focused on a basic unit of care and additional costs are met dollar-for-dollar by additional fees. The paper shows that if fees are more pro-rich than utilization, government spending will be least pro-rich under the constant-cost assumption and most pro-rich under the proportionality assumption. The linear assumption results in a concentration index for subsidies that lies between these two extremes. These results are borne out in an analysis of the incidence of government health spending in Vietnam (a country where fees are more pro-rich than utilization); indeed, under the constant-cost assumption, subsidies are pro-poor while they are pro-rich under the proportionality assumption. The paper also considers the biases created by not allowing for insurance reimbursements.

This paper—a product of the Human Development and Public Services Team, Development Research Group—is part of a larger effort in the department to develop evidence on distributional issues in the social sectors. Policy Research Working Papers are also posted on the Web at <http://econ.worldbank.org>. The author may be contacted at awagstaff@worldbank.org.

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by

Adam Wagstaff^a,

^a Development Research Group, The World Bank, Washington DC, USA

Corresponding author and contact details: Adam Wagstaff, World Bank, 1818 H Street NW, Washington, D.C. 20433, USA. Tel. (202) 473-0566. Fax (202)-522 1153. Email: awagstaff@worldbank.org.

Keywords: benefit incidence analysis; government health spending; propoor health spending.

Acknowledgements: This paper grew out of a discussion with Aparnaa Somanathan, who also shared with me Vietnam's latest NHA data. I am grateful to Marcel Bilger and Davidson Gwatkin for very helpful comments on earlier versions of the paper. The findings, interpretations and conclusions expressed and any errors are entirely mine; the views expressed do not necessarily represent those of the World Bank, its Executive Directors, or the countries they represent.

I. Introduction

For a variety of reasons, it is generally accepted that government health expenditures should disproportionately benefit the poor (cf. e.g. O'Donnell et al. 2007). In practice, in most developing countries the opposite is the case, although there are exceptions such as Malaysia, Sri Lanka and Thailand (cf. van de Walle 1995; Castro-Leal et al. 1999; Sahn and Younger 2000; Filmer 2003; O'Donnell et al. 2007).

This paper examines the implications of a key assumption that is made when imputing subsidies in benefit incidence analysis (BIA), namely that the unit cost of a government-provided service bears no relation to the out-of-pocket payments paid by the patient. An alternative—and arguably more plausible—assumption is that larger out-of-pocket payments for a given unit of utilization reflect more (or more costly) services being delivered. Fees in many government-run health systems are not flat-rate but rather vary according to the quantity and costliness of the tests, procedures, and drugs being administered.

The paper explores theoretically (in section II) and empirically (in section III, using data from Vietnam) the implications of assuming that the unit cost of care for a particular unit of utilization is proportional to or linearly related to the out-of-pocket payments paid by the patient. The more general linear case subsumes the constant-cost and proportionality assumptions as special cases, but also subsumes another interesting special case where general revenues subsidize a basic unit of care and additional costs are met dollar-for-dollar by additional fee payments. The paper finds that if fees are more pro-rich than utilization, the proportionality assumption yields the most pro-rich distribution of subsidies, and the constant-cost assumption the least pro-rich distribution. The linear cost assumption produces a

concentration index that lies between these two extremes. Section III explores the incidence of government health spending in Vietnam under the three different assumptions. In Vietnam, fees are more pro-rich than utilization, and the results confirm the ordering of distributions; indeed, under the constant-cost assumption, subsidies are pro-poor while they are pro-rich under the proportionality assumption, as well as in the more general linear case when the relationship between unit costs and fees is such that there is a basic cost of care and additional costs are met dollar-for-dollar by additional fees. An incidental finding of the paper is that previous studies—that have been based on the constant cost assumption—would not have found government health spending in Vietnam to be pro-rich had negative imputed subsidies not been set to zero in the analysis. The significance of these negative subsidies is argued to be a symptom of the inadequacy of the constant cost assumption.

II. How Current BIA Conventions May Lead to Inaccurate Estimates of the Incidence of Government Spending

The aim of BIA is to estimate the distribution—by income—of government subsidies to the sector in question. This section sets out the traditional constant unit cost assumption; it also explores some other more plausible assumptions and the implications of the various assumptions for the measured degree of inequality in government subsidies.

Subsidies at the individual level are the difference between the costs incurred by public-sector providers and the fees paid by the user:

$$(1) \quad S_{ki} = C_{ki} - F_{ki} ,$$

where S_{ki} is the subsidies individual i receives from subsector k (e.g. hospital inpatient care), C_{ki} are the costs incurred by providers in subsector k in providing services to individual i , and F_{ki} are

the fees paid by individual i to providers in subsector k . At the individual level, only F_{ki} are recorded in household survey data. The C_{ki} , by contrast, are not recorded in the survey. Aggregates of each term in eqn (1) are available, of course. Assumptions need to be made in order to impute subsidies at the individual level and hence to estimate the distribution of the S_{ki} by income, which is the goal of BIA.

The constant cost assumption

The standard assumption made when imputing subsidies to individuals (cf. e.g. O'Donnell et al. 2007; O'Donnell et al. 2008) is that unit costs are constant across units of utilization, q_{ki} , and are the same for everyone:

$$S_{ki} = c_k q_{ki} - F_{ki}.$$

The unit cost, c_k , can then be got from the national health account (NHA). Aggregating across individuals, we get:

$$c_k \sum_i q_{ki} = \sum_i S_{ki} + \sum_i F_{ki}$$

and therefore:

$$c_k = \frac{S_k + F_k}{\sum_i q_{ki}},$$

i.e. the unit cost for subsector k can be got by dividing the sum of aggregate subsidies and aggregate fee revenues by the aggregate number of units of utilization of subsector k . Hence we have

$$S_{ki} = \frac{S_k + F_k}{\sum_i q_{ki}} q_{ki} - F_{ki}.$$

Note that there is no assurance that S_{ki} , estimated this way, will always be positive. The response to this problem is often to replace negative estimates of S_{ki} by zeroes (see e.g. O'Donnell et al. 2007 p96). This is not altogether satisfactory, and as discussed further in section 3 the presence of implied negative subsidies actually suggests that the constant-cost assumption is unreasonable.

Our interest is in how subsidies vary with household income. This can be measured using the concentration index, a positive value of which indicates a pro-rich distribution, and a negative value of which indicates a pro-poor distribution. The concentration index of subsidies to subsector k , CI_{S_k} , can be expressed in terms of the concentration indices for utilization, CI_{q_k} , and fees, CI_{F_k} . The concentration index for costs is a weighted average of the concentration indices of subsidies and fees:

$$CI_{C_k} = \frac{S_k}{C_k} CI_{S_k} + \frac{F_k}{C_k} CI_{F_k},$$

where the weights are the fraction of costs (or revenues) accounted for by subsidies and fees respectively. Rearranging this gives us an expression for the concentration index of subsidies:

$$CI_{S_k} = \frac{C_k}{S_k} CI_{C_k} - \frac{F_k}{S_k} CI_{F_k}.$$

Given that costs are assumed to be proportional to utilization, we have

$$CI_{C_k} = CI_{q_k},$$

and therefore:

$$(2) \quad CI_{S_k} = \frac{C_k}{S_k} CI_{q_k} - \frac{F_k}{S_k} CI_{F_k}.$$

The concentration index of subsidies is smaller the less concentrated utilization is among the better off. But it is also smaller the *more* concentrated user fees are among the better off. In other words, government spending looks less pro-rich if the better off pay higher fees for a given number of units of utilization. In fact, subsidies could turn out to be pro-poor if fees are sufficiently disproportionately concentrated among the better off, even if utilization is higher among the better off. Furthermore, if the concentration index for subsidies is computed from the concentration indices for utilization and fees using eqn (2), the result could be a concentration index that is smaller than -1 or larger than +1 (the standard range for the concentration index); this would happen when some individuals have negative subsidies.

Assuming fees are proportional to unit costs

The assumption being made in the standard approach to BIA, then, is that each unit of utilization is associated with the same unit cost; the more fees that someone pays for a given unit of utilization, the smaller is the subsidy they receive. The reality may be quite different. It may well be that the better off pay higher fees precisely because they receive more services per unit of utilization; i.e. they are charged according to the services they receive, not according to the number of units of utilization. In many (perhaps most) countries, user fees are explicitly linked to the quantity of services rendered, rather than being flat rate for each unit of utilization (e.g. each outpatient visit). Fee schedules also often reflect the cost of the services rendered, e.g. more expensive drugs and tests have higher fees associated with them. When fees reflect the quantity and costs of services rendered, the better off may well be paying more in fees (if they do pay more) because they get more—or more expensive—tests or drugs for a given outpatient visit or inpatient admission.

An alternative to the standard BIA assumption would be that costs vary across individuals according to the fees paid. Expressing fees as the product of unit fees and utilization, we have:

$$S_{ki} = c_{ki}q_{ki} - f_{ki}q_{ki}.$$

As a first approximation, we could assume that unit fees and unit costs are *proportionate* to one another; this assumption is relaxed in the next subsection. Thus:

$$c_{ki} = \alpha_k f_{ki},$$

where we expect α to be larger than 1 given that utilization is subsidized. We have:

$$S_{ki} = \alpha_k f_{ki}q_{ki} - f_{ki}q_{ki} = (\alpha_k - 1)f_{ki}q_{ki}.$$

The fraction $(\alpha_k - 1)$ can be computed from aggregate data:

$$\alpha_k - 1 = \frac{S_k}{F_k}.$$

Hence we have:

$$S_{ki} = \frac{S_k}{F_k} f_{ki}q_{ki} = \frac{S_k}{F_k} F_{ki},$$

so that total subsidies received by individual i are proportional to the fees they pay, where the factor of proportionality is simply the ratio of subsidies to fees. Note that using this method, the estimated value of S_{ki} is always nonnegative.

Under this alternative assumption, the concentration index for subsidies is simply equal to the concentration index for fees:

$$(3) \quad CI_{S_k} = CI_{F_k}.$$

Thus in contrast to the standard BIA constant-cost assumption, under this alternative assumption the more concentrated fees are among the better off, the greater is the pro-rich bias in the incidence of government spending.

Comparing the constant-cost and proportionality assumptions

The two assumptions will typically give different results concerning the pro-rich bias in government spending. Specifically, the proportionality assumption will give a larger pro-rich bias (i.e. the concentration index for subsidies will be larger under the alternative method) if the following condition holds:

$$(4) \quad \Delta = CI_{F_k} - \frac{C_k}{S_k} CI_{q_k} + \frac{F_k}{S_k} CI_{F_k} > 0$$

or equivalently if

$$(4') \quad CI_{F_k} > CI_{q_k}.$$

Thus if fees are more concentrated among the better off (or less concentrated among the poor) than utilization, the proportional cost assumption will yield a more pro-rich (or less pro-poor) distribution than the constant-cost assumption.

A more general assumption

The assumption of proportionality may be too strong. A second alternative to the constant unit cost assumption would be to assume that unit costs are a linear function of fees:

$$c_{ki} = a_k + \alpha_k f_{ki}.$$

The intercept a_k could be interpreted as the cost of providing a basic unit of care of type k ; this cost is covered by the government out of general revenues. Fees are paid when the care is more costly than a_k . If $\alpha_k > 1$, the fees paid do not fully cover the additional costs and subsidies are used to cover part of the costs of non-basic care. With the linearity assumption we have

$$S_{ki} = (a_k + \alpha_k f_{ki})q_{ki} - f_{ki}q_{ki} = a_k q_{ki} + \alpha_k f_{ki}q_{ki} - f_{ki}q_{ki} = a_k q_{ki} + (\alpha_k - 1)F_{ki} ,$$

and the concentration index for subsidies is now equal to

$$(5) \quad CI_{S_k} = \frac{a_k q_k}{S_k} CI_{q_k} + \frac{(\alpha_k - 1)F_k}{S_k} CI_{F_k} ,$$

i.e. it is a weighted sum of the concentration indices for utilization and fees, the weight on the former being larger the more general revenues are used to subsidize basic care.

Eqn (5) nests eqns (2) and (3) as special cases. In the standard BIA approach, unit costs are constant and unrelated to fees, equivalent to setting a_k equal to c_k , and α_k equal to 0. Eqn (5) then reduces to eqn (2). The proportionality assumption, by contrast, amounts to assuming that there is no basic care not associated with the payment of fees, and fees are simply proportional to costs, albeit not equal to unit costs, i.e. $\alpha_k < 1$. In this case, eqn (5) reduces to eqn (3). Eqn (5) also allows for a third possibility, namely where i.e. $\alpha_k = 1$. In this case general revenues are concentrated on subsidizing the costs of basic care, and each dollar of cost incurred above the cost of basic cost is met by an additional dollar of fee revenue.

In contrast to the constant-cost and proportionality assumptions, there are two parameters of interest here. However, they are linked by the aggregate relationship between subsidies and fees. Given the assumptions above we have:

$$(6) \quad S_k = a_k q_k + (\alpha_k - 1)F_k .$$

Thus a higher value of a means a lower value of α , i.e. the larger the basic cost financed out of general revenues, the smaller the subsidy on non-basic care. Solving eqn (6) for α_k-1 , and substituting in eqn (5), we get:

$$(5') \quad CI_{S_k} = \frac{a_k q_k}{S_k} CI_{q_k} + \frac{(S_k - a_k q_k)}{S_k} CI_{F_k} .$$

We can see the effect of raising a_k on the concentration index for subsidies by differentiating eqn (5') with respect to a_k to get:

$$(7) \quad \frac{\partial CI_{S_k}}{\partial a_k} = \frac{q_k}{S_k} CI_{q_k} - \frac{q_k}{S_k} CI_{F_k} ,$$

which is negative if

$$CI_{F_k} > CI_{q_k} ,$$

i.e. the same condition as that under which the proportionality assumption gives a more pro-rich distribution than the constant-cost assumption. Eqn (7) shows that if fees are more pro-rich than utilization, the more emphasis there is on subsidizing basic care (i.e. the larger a_k is), the more pro-poor subsidies will be. Moving from the proportionality assumption to the unit-cost assumption is equivalent to raising a_k from zero to the value of a_k where α_k becomes zero. Intermediate values of a_k —above zero and below the point at which α_k becomes zero—will imply a distribution of subsidies that is less pro-rich than under the proportionality assumption but more pro-rich than under the constant-cost assumption. Arguably the most plausible maximum value of a_k is where α_k falls to one, since a value of α_k less than one implies the cost of the marginal unit is less than the amount paid in fees. At this point, where a dollar of additional cost above the cost of a basic unit of care is met by an additional dollar of fees, we have $a_k = S_k / q_k$ and eqn (5) reduces to

$$CI_{S_k} = CI_{q_k} ,$$

i.e. the subsidy distribution entirely reflects the utilization distribution.

III. Illustration Using Data from Vietnam

This section shows the implications of the three different approaches outlined above for the case of Vietnam. The incidence of government spending in Vietnam has been the subject of several studies (Prescott 1997; Wagstaff 2005; O'Donnell et al. 2007; O'Donnell et al. 2008), all of which show a pro-rich distribution of government health spending.

Data and assumptions

The household-level data for this study are taken from the 2006 Vietnam Household Living Standards Survey (VHLSS). In 2006, according to Vietnam's NHA¹, 60% of health spending in Vietnam was financed via out-of-pocket payments. According to the VHLSS, over half were payments to public providers, the rest being split fairly evenly between spending on drugs and payments to private providers (mostly private clinics rather than hospitals) (Lieberman and Wagstaff 2009 p6). The survey records outpatient visits over a period of a year to the principal government providers of outpatient care, namely commune health centers (CHCs), polyclinics, and government hospitals (district and provincial). For each visit, respondents are asked to record the out-of-pocket payments associated with the visit. The survey also records inpatient admissions to the main government provider of inpatient care, namely government hospitals. Respondents are also asked to record the out-of-pocket spending they incurred during the admission. The survey thus has good data on q_k and F_k for the four major government

¹ The data can be downloaded from <http://www.who.int/nha/country/vnm/en/>.

subsectors. The survey includes weights that allow the survey data on utilization and fee payments to be grossed up to the population level.

Table 1 shows the means and grossed-up population figures for the utilization data for each subsector, and the out-of-pocket spending data. The survey also has comprehensive data on household consumption of food and nonfood items, whether purchased or home-produced. This allows us to estimate the concentration indices, CI_{q_k} and CI_{F_k} . These are also shown in Table 1. Outpatient utilization rates at the CHC level are higher among the poor, while the opposite is true of outpatient visits to other facilities and inpatient admissions. Out-of-pocket spending at CHCs is less concentrated among the poor than CHC utilization is, and out-of-pocket spending at other facilities is more concentrated among the better off than utilization is.

The exercise also requires data on total government spending (i.e. subsidies) for each subsector, as well as total out-of-pocket payments to the subsectors as recorded in the government statistics. These are obtained from Vietnam's more detailed NHA. Table 2 presents the figures, and the note to the table explains how the figures are arrived at. Inevitably, assumptions have to be made in deriving the figures, as the NHA headings do not correspond exactly with the utilization breakdowns permitted by the household survey. Under 'personal health services' (item HD 1.1) the NHA records spending on inpatient and outpatient treatment by households and government (at the central, provincial and district levels), as well as spending by households on medicines for self-medication. Under 'health prevention and public health' (item HD 1.2) the NHA records spending by households and government (at the commune level) on 'primary health care and school health care'. The assumption made in Table 2 is that the spending on inpatient and outpatient care recorded in HD 1.1 refers to spending at the hospital level (district and above), while the spending on 'primary health care and school health care'

recorded under HD 1.2 covers spending incurred in CHCs and polyclinics, as well as schools. In Table 2 spending on school health is assumed to account for 25% of the total, and the rest is allocated between CHCs and polyclinics pro rata according to utilization volumes. Neither assumption is particularly satisfactory.

The out-of-pocket spending figure reported in the health ministry's NHA data in Table 2 is much less than the grossed-up figures from the household survey in Table 1. The gap between the health ministry's out-of-pocket figures and the survey figures is particularly pronounced in the case of inpatient care, where the official figure captures only 19.6% of the spending recorded in the survey. This discrepancy has been noted in previous work (Knowles et al. 2005 p12), where it was suggested that informal payments may account for part of the discrepancy. Transport costs are another likely source of discrepancy, since respondents in the VHLSS are asked to include "payments for medical service and treatment", but also "other related costs (e.g. bonus for doctors, transport)". Unfortunately there is no way to exclude transport costs from the household data.

BIA studies (those for Vietnam have followed this practice) typically believe the aggregate figure reported in the health ministry's statistics and assume that the survey data are wrong, due to inaccurate recall, or because they include payments for things other than health care, such as transport. Researchers then scale down the fees reported in the household survey by the ratio of reported aggregate user fees as a fraction of the NHA aggregates, with the result that the scaled user fees in the survey gross up to the NHA figure. Then the F_{ki} are scaled fees and F_k is the fee revenue reported in the NHA. An alternative approach, and not apparently used to date, is to believe the household survey data, and to assume that the ministry data may omit payments made by households to public providers. Government providers may hide fee

revenues from the ministry of health, or they may collect unofficial payments. Both constitute payments for resources used in delivering health care, and in that sense ought to be included.² In this approach, aggregate fees would be obtained from the survey, and aggregate costs for subsector k would be obtained by adding government spending on the subsector (i.e. subsidies to the subsector) to the grossed-up user fees from the survey data.

If the proportionality assumption is made, it makes no difference whether one uses the grossed-up out-of-pocket payment data from the survey or the NHA figure, since everyone's payments are scaled up or down by the same fraction and CI_{F_k} is unaffected, cf. eqn (3). By contrast, if the conventional constant-cost assumption is made, whether one uses the grossed-up household survey out-of-pocket spending total or the NHA figure *does* make a difference. Scaling up or down the reported fees leaves CI_{q_k} , CI_{F_k} and S_k unaffected in eqn (2), but C_k and F_k are both affected, F_k proportionately more than C_k . In the present case, where the survey leads to a larger aggregate out-of-pocket spending figure than the NHA, the effect of scaling down the survey data to gross up to the NHA figure is to put more weight on CI_{F_k} in eqn (2). Finally, if the more general assumption of a linear relationship between costs and fees is made, it makes no difference whether the survey fee payments are scaled up or down to the NHA figure, at least in the case where one holds constant a_k . In this case, α_k adjusts to hold $(\alpha_k - 1)F_k/S_k$ in eqn (5) constant, since otherwise the cost constraint, eqn (6), is no longer satisfied.

Results

Table 3 shows the inequality in the incidence of health sector subsidies in Vietnam, according to the various methods outlined above. The figures for total subsidies in each case are

² One problem for the second approach above is that informal payments may not be levied according to the fee schedule, so assuming subsidies are proportional to fees recorded in the survey may be problematic. This is not a reason to scale down user fees in the survey, though, or to favor the traditional approach to BIA. Rather it would be a reason to try to capture explicitly informal payments and to treat them separately—perhaps assuming they are proportional to income rather than linked to the fee schedule.

simply weighted averages of the concentration indices for each category of care where the weight is the share of subsidies for that type of care in total subsidies. The left-hand panel shows the results when the grossed-up survey data on out-of-pocket payments are used for total fees, and the right-hand panel shows the results when the survey data on out-of-pocket payments are scaled down so they gross up to the health ministry's official NHA figure.

The first set of results in Table 3 are when the traditional unit-cost assumption is made. Unit costs are dramatically smaller when the NHA data are used in the case of hospital care reflecting the lower aggregate fee figure when the NHA data are used. This results in less (negative) weight being put on the concentration index for F_k in eqn (2); as a result, subsidies appear to be more pro-rich or less pro-poor when the NHA data are used. An even bigger influence on the results under the constant-cost assumption is whether or not negative subsidies are set to zero. Irrespective of whether the grossed-up survey data or the NHA data are used, the effect of setting negative subsidies to zero is to change subsidies from being pro-poor to being pro-rich. In other words, it is highly likely that had previous studies of the incidence of government health spending in Vietnam not adopted the practice of setting negative imputed subsidies to zero, the conclusion would have been that government health spending in Vietnam disproportionately benefits the poor! Note that in this case the concentration index for polyclinic visits is outside the 'normal' interval for a concentration index, i.e. the range when the values of the underlying variable are all nonnegative.

It is worrying that what is done with negative subsidies makes such a difference to the results. It casts some doubt on the constant cost assumption and the view implicit in it that fees in general—and especially very large ones causing negative subsidies—tell us nothing about the cost of the care being received. The constant cost assumption treats negative subsidies as a

nuisance and sweeps them under the carpet. By contrast, the other two approaches explicitly assume that fees paid tell us something about the cost of care, and that particularly high fees indicate that the care received has been especially high-cost.

The second set of results in Table 3 assume that unit costs and unit fees are proportional. There is no need to set negative subsidies to zero here; indeed, in this approach subsidies are always nonnegative assuming $\alpha > 1$. In this case the concentration index for subsidies is simply the concentration index for fees, which is the same irrespective of whether the grossed-up survey data are used or the NHA data. Given the heavy weight on hospital care in government spending and the highly pro-rich distribution of fees for these types of care, the distribution of subsidies emerges as distinctly pro-rich under the proportionality assumption—far more pro-rich than under the constant cost assumption, even in the most pro-rich scenario where the out-of-pocket spending data are scaled to gross up to the NHA figure and where negative imputed subsidies are set to zero.

The third set of results in Table 3 relate to the general assumption, where unit costs and fees are linearly related. Table 3 explores two assumptions for a , and by implication α (once a has been set, α emerges by solving the cost equation, i.e. eqn (6)). In the first, a is set in terms of a fixed monetary amount, subject to α being at least 1, i.e. fees cannot exceed unit costs at the margin. In the absence of any estimates of the basic unit cost of each type of care, illustrative values a were chosen. For CHC visits and polyclinic visits the value of a was set as close to (the Vietnamese Dong equivalent of) \$ US 1.00 without α falling below 1. For hospital outpatient visits, a was set at the equivalent of \$2.00, and for inpatient visits a was set at the equivalent of \$10.00. Under these assumptions, α is 100% for CHC and polyclinic care, but larger than 100% for the other two types of care, i.e. units of care costing in excess of the cost

threshold are also subsidized. These assumptions result in a less pro-rich distribution of subsidies than under the proportionality assumption: the concentration index is just under 30% lower. The second assumption made about a and α is that α is 100%, i.e. the basic cost is subsidized and each dollar of cost above the basic cost is covered by an additional dollar's worth of fees. In this case, the concentration index for subsidies reduces to the concentration index for utilization. This case gives the most pro-poor outcome conditional on costs and fees being linearly related to one another. Given the results in section II, and given that fees are more pro-rich than utilization, subsidies in this case turn out inevitably to be more pro-rich than they are under the constant-cost assumption.

IV. Conclusions

The aim of this paper was to examine the implications in BIA of assuming that the unit cost of a government-provided service bears no relation to the out-of-pocket payments paid by the patient. It compared—theoretically and empirically—this assumption with an alternative and arguably more plausible assumption, namely that larger out-of-pocket payments for a given unit of utilization reflect more or more costly services being delivered. After all, fees in many (if not most) government-run health systems are not flat-rate but rather vary according to the quantity and costliness of the tests, procedures, drugs, etc. being administered.

Section II examined two alternatives to the constant-cost assumption, one where unit costs are proportional to fees paid, and a more general assumption where unit costs are linearly related to fees paid. The more general case subsumes the constant-cost and proportionality assumptions as special cases, but also a third special case where government revenues are focused on subsidizing a basic unit of care and costs above the basic unit are met dollar-for-

dollar by extra fees. The analysis showed that if fees are more pro-rich than utilization, the proportionality assumption yields the most pro-rich distribution of subsidies, the constant-cost assumption the least pro-rich distribution, and the third special case lies somewhere between these two extremes. Section III explored the incidence of government health spending in Vietnam under different assumptions. Previous studies have made the constant-cost assumption but have set to zero negative imputed subsidies. This turns out to make a difference between subsidies being pro-rich (the result reported in these studies) and pro-poor (the result that would have been obtained if negative subsidies had been retained). When the constant-cost assumption is replaced by the proportionality assumption, subsidies turn to being pro-rich; in the more general case, when unit costs and fees are linearly related, they are still pro-rich albeit less so. In this latter case, when general revenues are used to focus on subsidizing a basic unit of care, subsidies still emerge as pro-rich, more so in fact than in previous studies when negative imputed subsidies have been set to zero.

There is a complication not considered in the above, or indeed in other BIA studies, namely health insurance. Lack of data makes it impossible to allow for it, but one can speculate on the likely direction of bias introduced by not allowing for it. Eqn (1) assumes that providers cover their costs through subsidies or fee income levied on patients. In Vietnam, as in many other countries, providers (or at least hospitals) receive fee income but also income from insurers. In Vietnam, with the exception of insurance for school-children, there is just one government insurer that provides cover (at the taxpayer's expense) to the poor (and other vulnerable groups), (at the employer's and employee's expense) to formal-sector workers, and (at the taxpayer's expense) to civil servants, war veterans and other "people of merit". The insurer reimburses hospitals according to the same scale that the hospital uses to charge uninsured patients. A more complete analysis would extend eqn (1) to include insurance

reimbursements. Under the constant cost assumption, this would lead to a third term on the right-hand side capturing the (negative of) the concentration index for reimbursements by the insurer to providers weighted by the total amount of reimbursements relative to subsidies. Although the pattern of insurance coverage in Vietnam is u-shaped, the likelihood is that coverage is still, on average, higher among the better off. And because the better off use services more even among the insured, the concentration index for reimbursements is also likely to be positive. The results obtained with the constant cost assumption when insurance is overlooked are therefore likely to overestimate the pro-richness of subsidies. Establishing empirically whether this is the case is not possible with existing data since the household data do not include the amount the insurer reimburses the provider for each unit of utilization, only what the patient pays. In the case of the proportional cost assumption, one might assume that unit costs are proportional to the sum of user fees and insurance reimbursements. This would mean eqn (3) would become the unweighted average of the concentration indices for fees and reimbursements. It seems likely that reimbursements would be less pro-rich than fees, so the results obtained using the proportionality assumption are likely to overstate the pro-richness of subsidies. Finally, in the linear cost case, one might again replace fees by the sum of fees and reimbursements, which would mean that the final concentration index in eqn (5) would be for fees plus reimbursements; this is likely to be less pro-rich than fees only. However, the weight attached to the concentration index would also be higher (the F_k in the numerator of the last term in eqn (5) would be replaced by the sum of aggregate fees and reimbursements), so the net effect is unclear. In the special case where $\alpha_k=1$, and all fees and insurance reimbursements are for costs above the basic amount, whether insurance is taken into account or not makes no difference, because the last term in eqn (5) disappears.

Table 1: Utilization and out-of-pocket spending, by subsector

Variable	Mean per person	Aggregate figure for Vietnam	Concentration index (CI)
<i>Visits/admissions per person p.a. (q_k)</i>			
Outpatient: CHC	0.30	24,934,564	-0.1926
Outpatient: polyclinic	0.04	3,360,418	0.0200
Outpatient: hospital	0.38	31,737,412	0.1972
Inpatient: hospital	0.07	6,124,170	0.0649
<i>Out-of-pocket spending per person p.a. (F_k)</i>			
Outpatient: CHC	7.25	598,103	-0.1410
Outpatient: polyclinic	2.85	235,070	0.3939
Outpatient: hospital	71.34	5,884,149	0.4237
Inpatient: hospital	106.96	8,822,251	0.3955

Notes: The survey includes 39,071 cases, each with an average sampling weight of 82,480,853. Spending figures are in thousands of Vietnamese Dong. CHC stands for 'commune health center'. The means and the concentration indices are computed from the 2006 VHLSS; sampling weights are used in their computation. The concentration index is computed by ranking individuals according to their per capita household consumption, inclusive of food consumption (whether domestically produced or purchased out of the home), but exclusive of health expenditures.

Table 2: Aggregate data for BIA and implied weights for different methods

	CHC	Outpatient		Inpatient
		Polyclinic	Hospital	Hospital
Govt. spending (<i>S</i>)	162,481	21,898	3,971,381	3,276,459
Out-of-pocket spending (<i>F</i>)	526,035	70,894	4,919,599	1,729,406

Notes: The government spending (i.e. subsidies) and out-of-pocket payments to public facilities (i.e. fees) are in millions of VND and relate to 2005, the closest year to 2006 for which detailed NHA data are available. The data are taken from the NHA Table 2. The government spending figures reflect spending by health ministry and central level, and health departments at the provincial, and district levels, as well as spending by the social health insurance agency, Vietnam Social Security. Out-of-pocket payments are listed as spending by households in the NHA Table 2. The table does not break government and out-of-pocket spending down exactly by provider type. The assumption is that spending on 'traditional medicine' is all at the hospital level. Government and out-of-pocket spending on inpatient care are taken from the figures labeled 'inpatient treatment' and 'outpatient treatment' under the 'traditional medicine' heading, i.e. items HD 1.1.1 and HD 1.1.2 respectively. Spending at CHC and polyclinic level are taken from the heading 'primary health care and school health care' under 'health prevention and public health', i.e. item HD 1.2.4. This is the only item in the NHA where spending at the commune level is recorded, but it is possible that some of the polyclinic spending is recorded at a higher level. It was assumed that 75% of the 'primary health care and school health care' was incurred in health facilities, and the rest in schools.

Table 3: Inequalities in subsidies according to different assumptions

	Grossed-up survey data					NHA data				
	Outpatient			Inpatient	Total	Outpatient			IP	Total
	CHC	Polyclinic	Hospital	Hospital		CHC	Polyclinic	Hospital	Hospital	
Constant cost assumption										
Unit cost	30,503	76,469	310,534	1,975,567		27,613	27,613	280,142	817,395	
Concentration indices										
Negative subsidies set to zero	-0.2047	-0.0829	0.1432	-0.0471	0.0346	-0.2045	-0.0811	0.1446	-0.0158	0.0714
Negative subsidies <i>not</i> set to zero	-0.3862	-3.9938	-0.1384	-0.8253	-0.4580	-0.3629	-1.1905	-0.0834	-0.1096	-0.1043
Proportionality assumption										
α	127%	109%	167%	137%		127%	109%	167%	137%	
Concentration indices	-0.1400	0.3939	0.4237	0.3955	0.3989	-0.1400	0.3939	0.4237	0.3955	0.3989
General assumption										
Case (a)										
a	6,516	6,516	36,920	184,600		6,516	6,516	36,920	184,600	
α	100%	100%	148%	124%		100%	100%	157%	224%	
Concentration index	-0.1926	0.0200	0.3569	0.2814	0.3106	-0.1926	0.0200	0.3569	0.2814	0.3106
Case (b)										
a	6,516	6,516	125,133	535,004		6,516	6,516	125,133	535,004	
α	100%	100%	100%	100%		100%	100%	100%	100%	
Concentration index	-0.1926	0.0200	0.1972	0.0649	0.1298	-0.1926	0.0200	0.1972	0.0649	0.1298

Notes: Unit costs in the constant-cost case are calculated by dividing the sum of subsidies (S) and fees (F) by utilization (q), as explained in the text. Where negative subsidies are set to zero, the subsidies are computed at the individual level in the data, negative values are set to zero, and the concentration index for subsidies is computed from the resulting truncated distribution. The remaining concentration indices for subsidies are computed using the concentration indices in Table 2 and the appropriate expressions in the text, i.e. eqn (2) in the case of the constant-cost assumption, eqn (3) in the case of the proportionality assumption, and eqn (5) in the general linear case. In the general case (a), the value of a is chosen as high as possible subject to α not being less than 1. In the general case (b), a is set so that $\alpha=1$.

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